



A Battery-Less Wirelessly Powered Frequency-Swept Spectroscopy Sensor

Tech ID: 31987 / UC Case 2019-847-0

SUMMARY

UCLA researchers in the Department of Electrical and Computer Engineering have developed a wirelessly powered frequency-swept spectroscopy sensor.

BACKGROUND

Wireless power transfer is in increasing demand as the development of network sensors and bio-implantable devices gain popularity. Integration of a vast network of sensors with miniaturized sensor nodes is essential to power minimally intrusive medical implants. Among current energy sources, far-field electromagnetic radiation performs better than near field inductive coupling due to larger operating distances and less path loss. However, large external antennas are needed by far-field RFID which can easily exceed 10 cm² in area, and cause interference from TX to RX. A far-field RFID systems with reduced size and improved performance is highly needed.

INNOVATION

UCLA researchers have developed a fully integrated wirelessly powered microchip with a small footprint of 2.47mm². The chip includes an energy-harvesting front-end, a power management unit, a super-harmonic injection-locked oscillator, and on-chip receiving and transmitting antennas. The chip was successfully developed and achieved a maximum operating distance of 8cm, a 22% locking range from 4 to 5GHz, and a phase noise of -93dBc/Hz at 100Hz offset. The large locking range allowed for spectroscopy measurements on a variety of materials and fluids.

APPLICATIONS

- ▶ Medical implants: detection of bleeding, body fluidic, cancerous tissue, etc.
- ▶ Industrial monitoring: detection of corrosion, crack, or change in the dielectric.
- ▶ Consumer electronics: fingerprint detection, touch sensors, objects identification, etc.

ADVANTAGES

- ▶ Extended operating distance
- ▶ Enhanced sensitivity
- ▶ Reduced power consumptions from the duty cycle mode
- ▶ Large locking range

STATE OF DEVELOPMENT

Device prototyped and characterized. Proof-of-concept spectroscopy measurements performed on various materials and fluids.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20220252506	08/11/2022	2019-847

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INVENTORS

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OTHER INFORMATION

KEYWORDS

wireless, power, battery-less, antenna, spectroscopy, energy

CATEGORIZED AS

- ▶ **Communications**
 - ▶ Networking
 - ▶ Wireless
- ▶ **Computer**
 - ▶ Hardware
- ▶ **Energy**
 - ▶ Storage/Battery
 - ▶ Transmission
- ▶ **Engineering**
 - ▶ Engineering
- ▶ **Materials & Chemicals**
 - ▶ Electronics Packaging
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 - ▶ Assembly and Packaging
- ▶ **Sensors & Instrumentation**
 - ▶ Medical
 - ▶ Physical Measurement

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